# COMMUNICATING SCIENCE EFFECTIVELY

Ben Longstaff and Caroline Wicks
**EcoCheck (NOAA-UMCES Partnership)**

Ben Fertig
**Integration and Application Network**
**(University of Maryland Center For Environmental Science)**

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

CHESAPEAKE EcoCheck
Assessing and forecasting ecosystem status
NOAA
University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE
www.eco-check.org

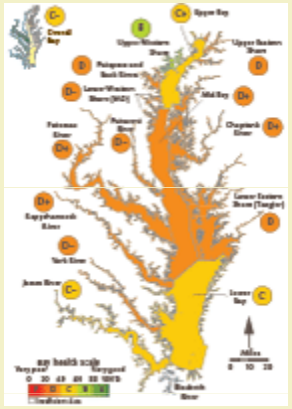
Integration & Application Network

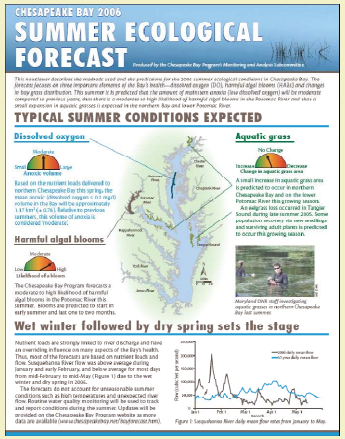
# Our background - Integration and Application Network (IAN)

- **An initiative of the University of Maryland Center for Environmental Science**
- **Synthesize and interpret new scientific findings to develop an integrated picture**
- **Scientists interested in solving, not just studying environmental problems**
- **Led by Dr. Bill Dennison**


# Our background: EcoCheck

- **Partnership between NOAA and the Integration and Application Network (IAN)**
- **Aim: "*enhance and support the science, management and restoration of Chesapeake Bay through the integration of geographically detailed assessments and forecasts.*"**
- ***Effective science communication is essential element of our aims***



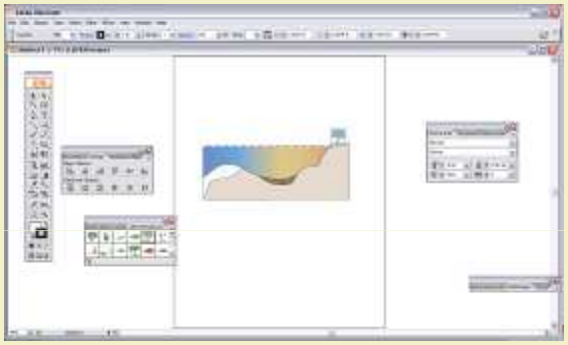


# Teaching science communication

- **IAN / EcoCheck running science communication courses for over 4 years**
- **Based on experience and theory →Scientist practicing science communication**
- **Conducted courses nationally and internationally**
- **Published a book, and a second related book is on the way.**


# The course

- **Lectures to introduce you to the topic**
- **Activities to make it more fun**
- **Demonstrations to show you how to use the software**
- **Exercises to give you the chance to apply the skills**

# Who are you?

- **Participants from:**
  - SC DNR
  - NOAA Coastal Services Center
  - NOAA Hollings Marine Lab
  - S.C. Sea Grant Extension
  - DHEC-OCRM
- **Backgrounds**
  - HML Communications
  - Mariculture
  - SC Clean Vessel Program
  - Ace Basin/NERRS
  - MARMAP
  - S.C. Sea Grant Extension, Coastal Communities
  - SERTC
  - Marine Game Fish Tagging Program

# An Introduction to effective science communication

Ben Longstaff

South Carolina Science Communication Course
April 7-10, 2008

University of Maryland
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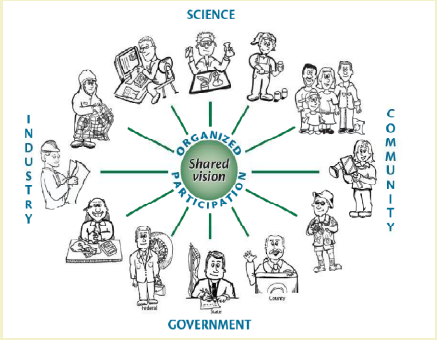
Integration & Application Network

# Objectives

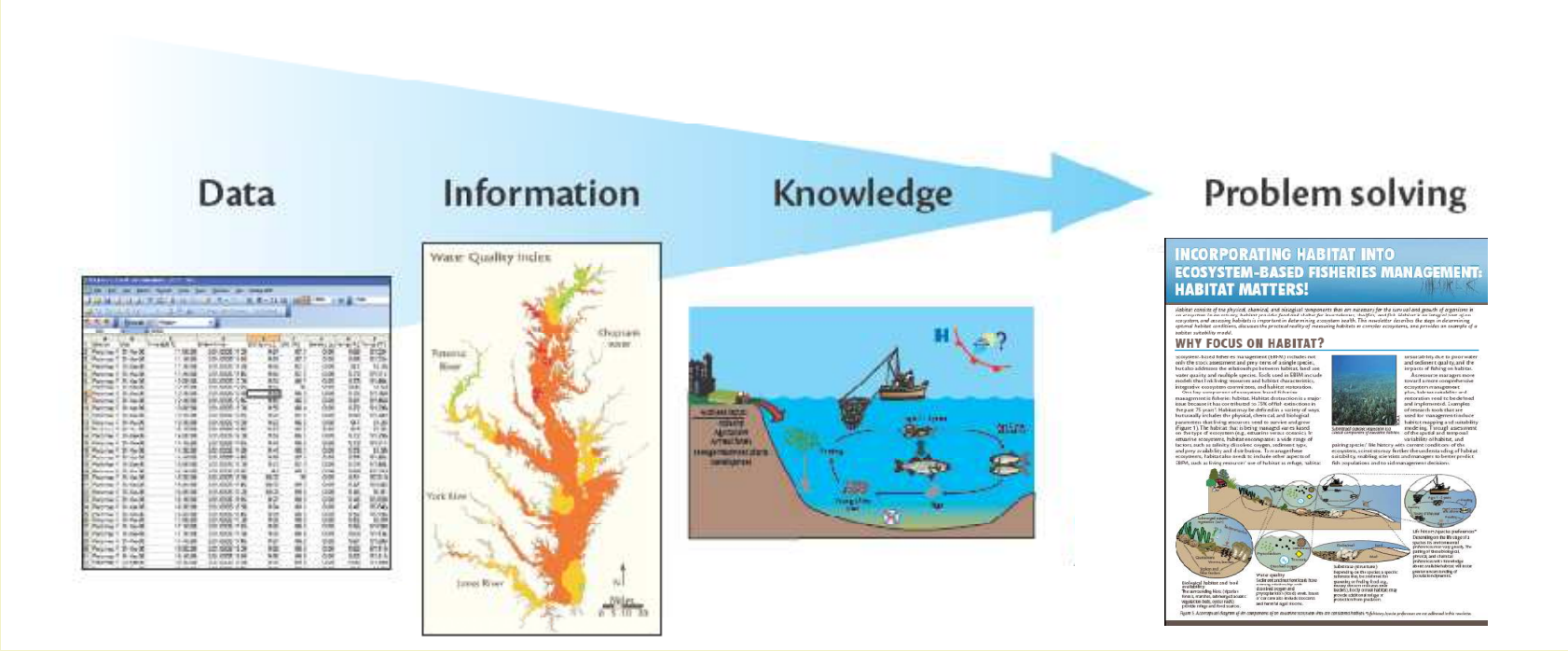
- ***Communication strategy overview***




- ***Provide*** **some overarching science communication principles**


- ***Establish*** **an underlying philosophy for science communication**

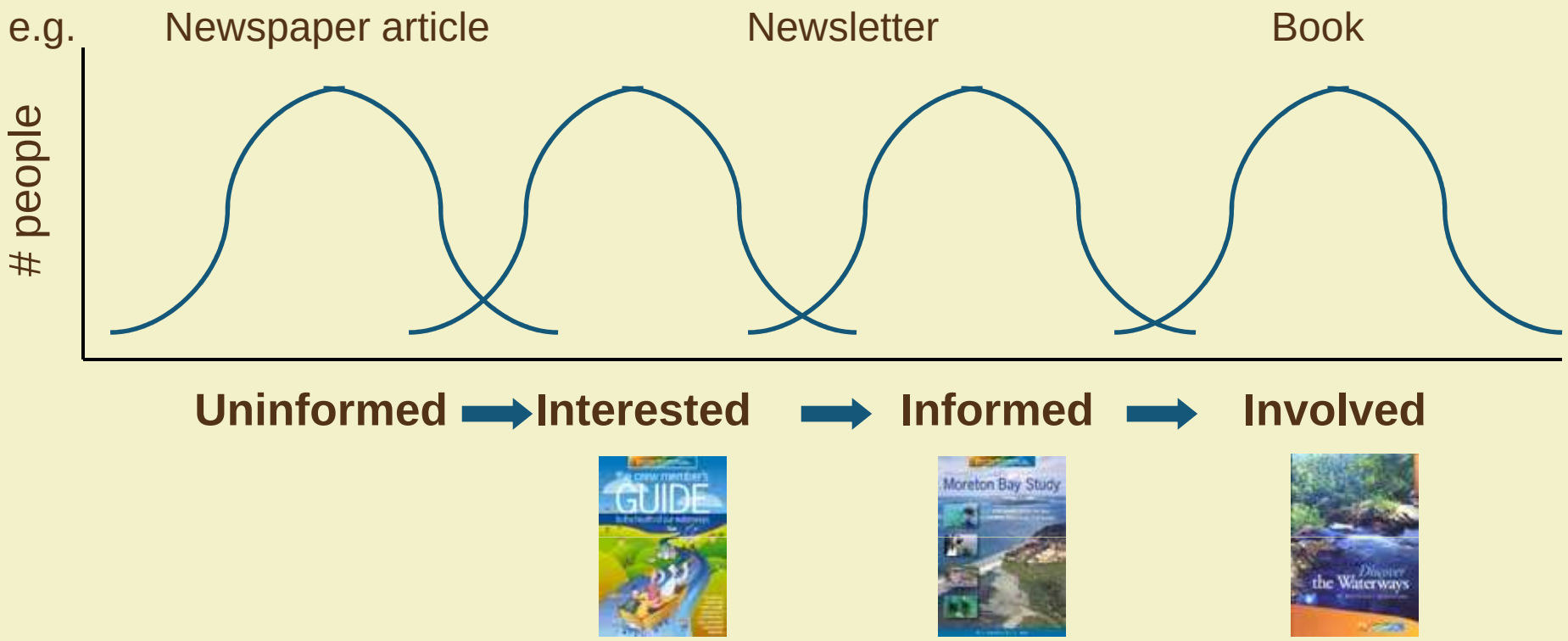
# Science communication: one of the final yet most important steps




***You are not doing anything if nobody knows what you are doing***

# Science communication to create change

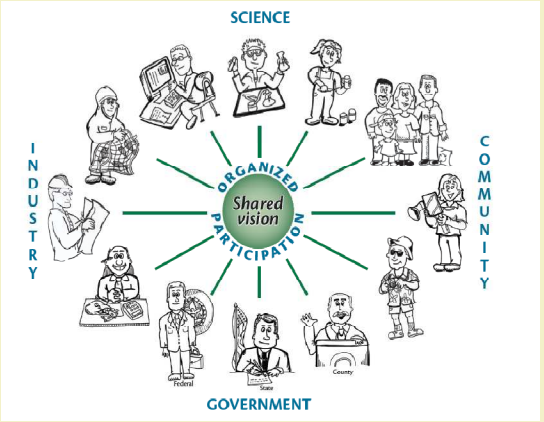
- **Target communication to audiences level of engagement**
- **Aim to increase level of engagement**



# Developing a communication plan

## A few principle to consider:

- Your target audience
- Appropriate communication vehicle/s
- Key messages
- Packaging and delivering your message
- Completion timeframe





# Determining your target audience

***Determining the target audience***

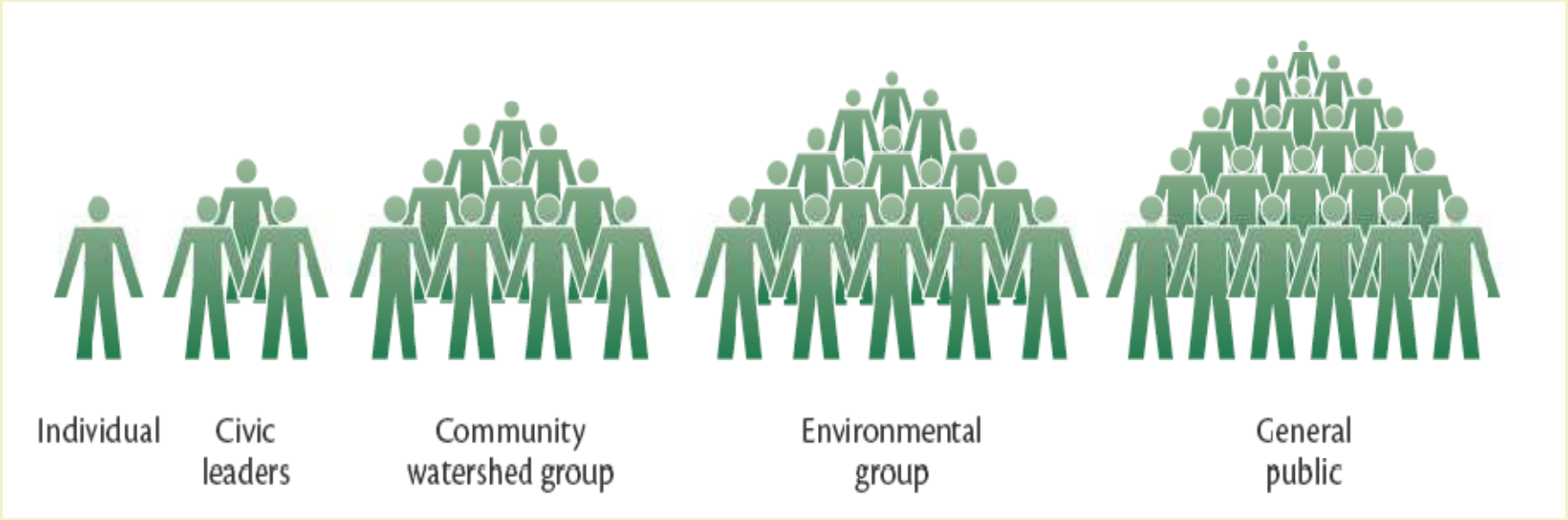
- Who needs to hear what I am saying?
- Who will find my information useful?
- Who can use my information to better do their job?
- Who can use my information to change things?


**Different target audiences have different sizes, and consequently require different communication techniques.**

# Determining your target Audience

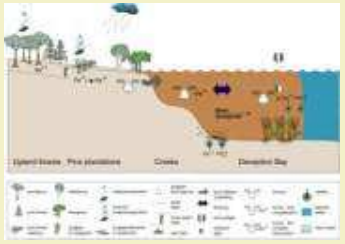
**Use science communication principles to target a broad audience**

**e.g. synthesis, visualization & context**

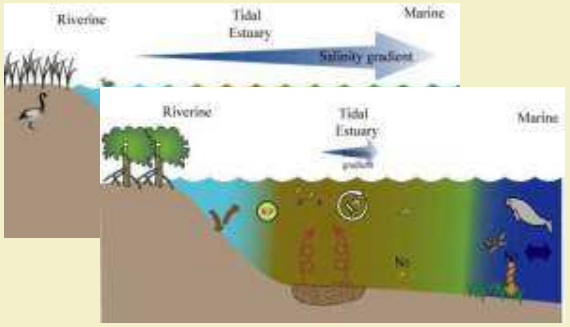


# Good science communication can make you a better scientist

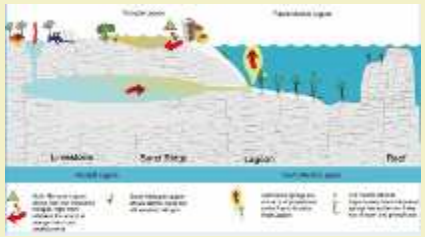
**Completeness**
Envisioning the ‘story’ can lead to comprehensive research program



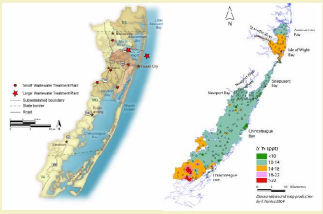
**Context**
Identifying the linkages and developing comparisons can provide important insights



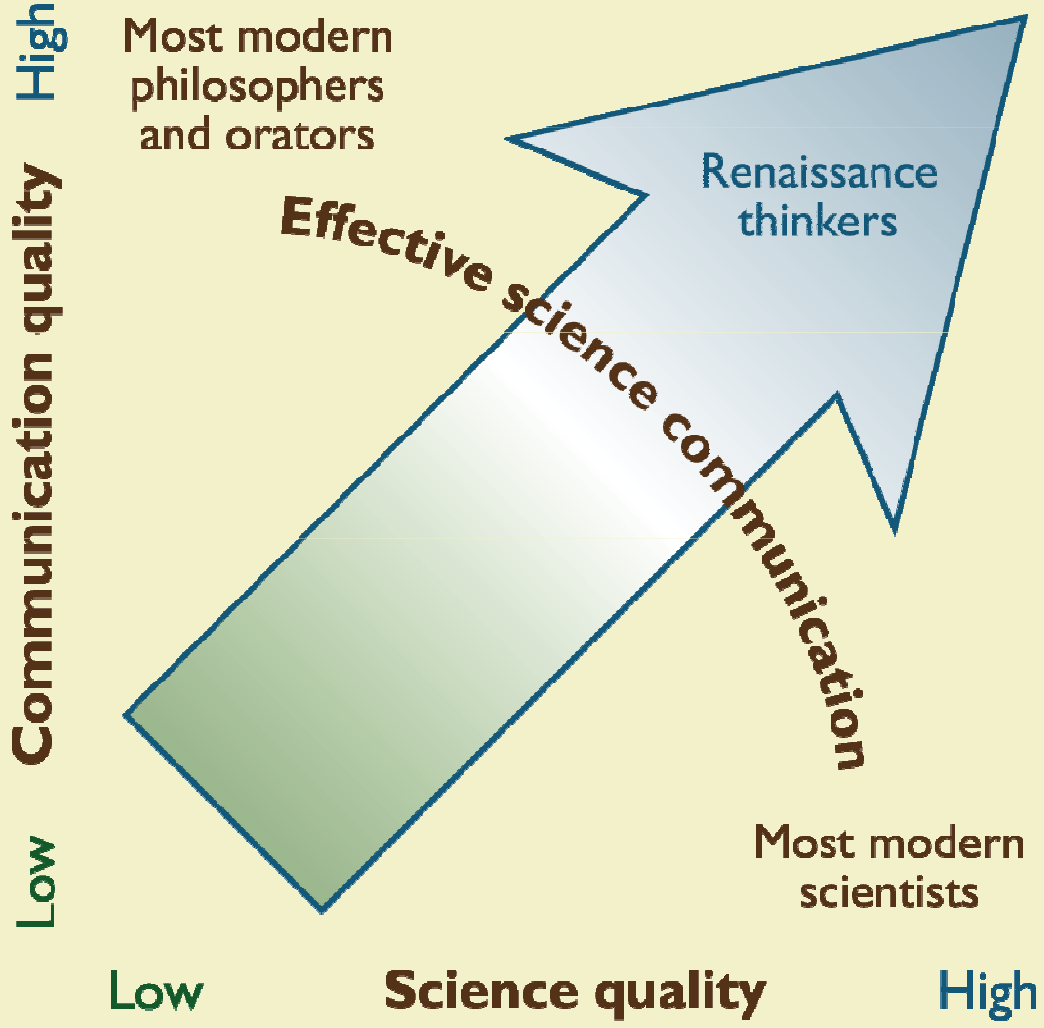

**Clarify**
Having to identify the fundamental message removes vagueness in thinking



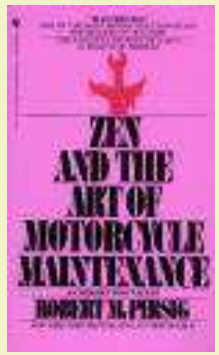
**Synthesis**
Combining and comparing different data sets or approaches can lead to insights



# Good science communication requires attention to both the science and the presentation



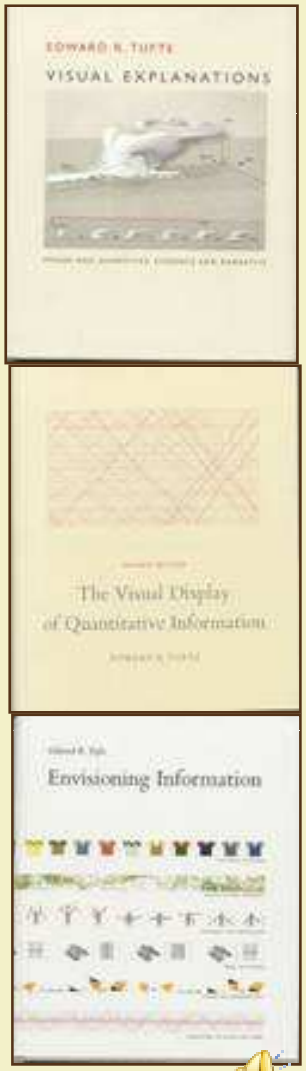

"What you've got here, really, are two realities, one of immediate artistic appearance and one of underlying scientific explanation, and they don't match and they don't fit and they don't really have much of anything to do with one another. That's quite a situation. You might say there's a little problem here."




Robert Pirsig, 1974

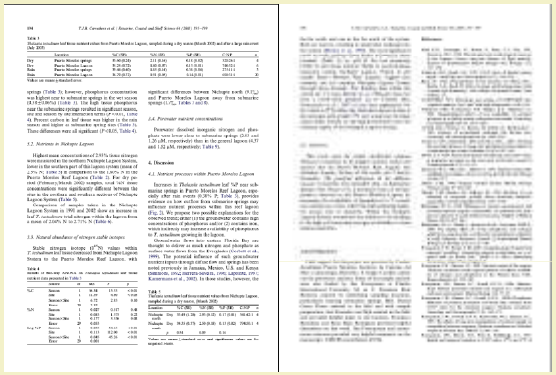
# Principles of Analytical Design; E. Tufte

- **“Don’t get it original, get it right”**
- **Integrate word, image, numbers**
- **Include documentation (data sources)**
- **Content-driven; presentation enables thinking**
- **Put important comparisons adjacent in space**
- **Use small multiples (maximize content variation; minimize style variation)**
- **Audiences are precious (know your content; respect your audience)**
- **Use humor, memorable hyperbole**
- **Preparation: Practice, practice, practice; develop better content**

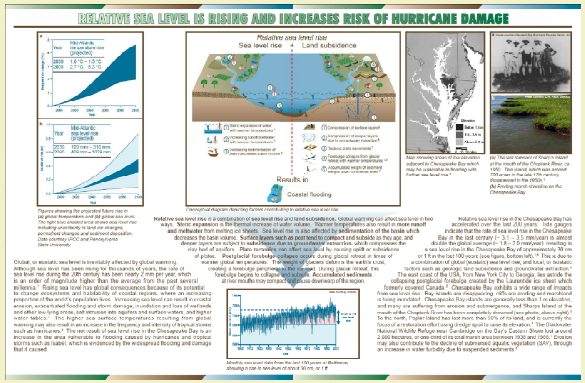


# There are differences between science writing & science communication

- Getting it right
- Providing scientific context (references)
- Text > graphics
- Peer audience
- Mostly black and white
- Authorship exclusive
- Focus on results and interpretation



- Getting it done
- Providing societal context (examples)
- Text ≈ graphics
- Broader audience
- Full color
- Authorship inclusive
- Focus on conclusions and recommendations

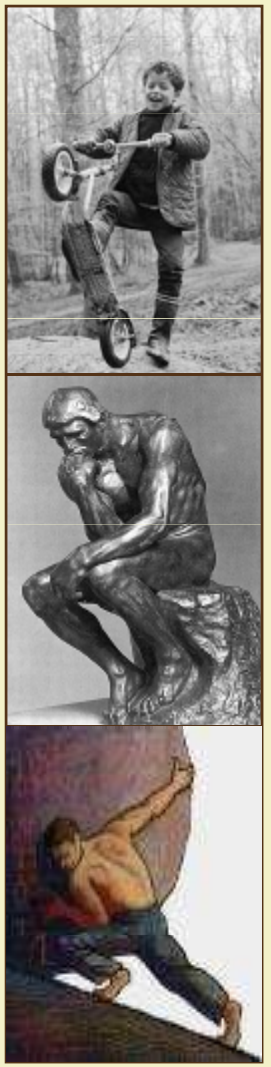


# IAN Principles of science communication

- **Provide synthesis, visualization & context**
- **Get real; relate to audience – big picture to local relevance**
- **Simplify terms but not content (don't *dumb it down*, do *raise the bar*)**
- **Assemble self-contained visual elements**
- **Consistent *style* and *format***
- **Lose the jargon, dude**
- **Define all terms , e.g. SE = Standard Error**
- **Minimize AU (Acronym Use)**
- **Engage audience: prepare for and invite questions**
- **Use color, but use it judiciously**

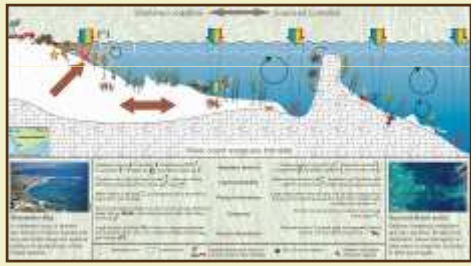
# The 'zen' of science communication

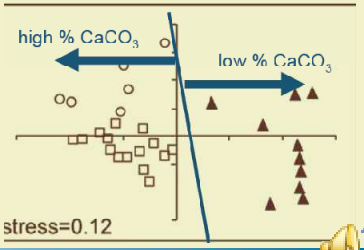
- *Enthusiasm* counts: get excited
- Give yourself adequate *quality time*
- *Feedback & revision* essential: seek it out



# The art of science communication

- **Conceptual diagrams: context and synthesis**
- **Maps: geographic context and information-rich**
- **Photos: describe methods, study site description, processes and relevance**
- **Video clips: capture system dynamics**
- **Tables and figures: scientific data**



# Synthesis, visualization & context are key elements of science communication

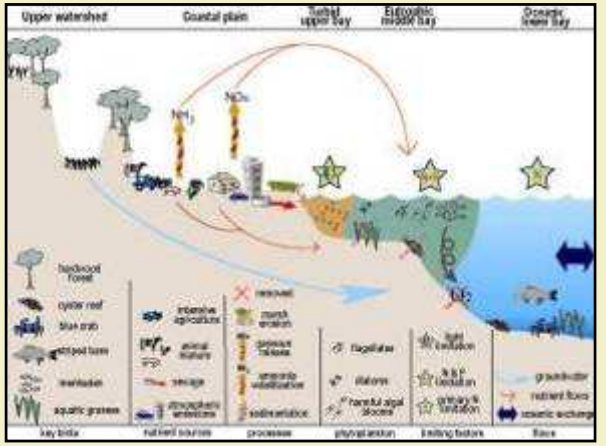
## Synthesis


Provide analyzed, interpreted & synthesized data

## Visualization

Show them: who, what, where, when, how & so that you can tell them why

## Context



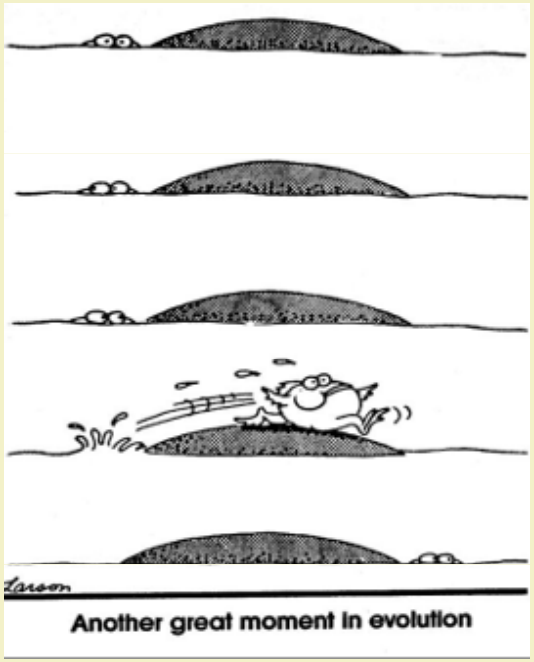

Provide answers for: “Why should I care?” & “So what?”

# Good science communication is no JOKE

JOKE = Jargon-filled, Obtuse language that Keeps audience Entirely ignorant

**Science communication that relies extensively on JOKEs is a self-indulgent representation of simple ideas, obfuscated with technospeak to make the scientist appear astute, yet serves to be obtuse and belittles the audience.**

# but topical humor can be effective…

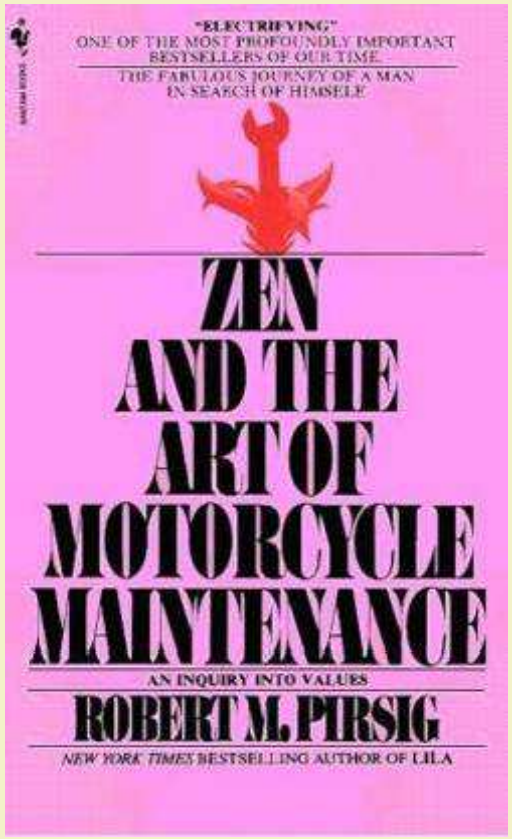



**Seagrasses 'reinvaded' the sea from terrestrial ancestors**

# Conclusion:

replaced "motorcycle maintenance" with "science communication"

*“Not everyone understands what a completely rational process this is, this science communication. They think it's some kind of a "knack" or some kind of "affinity for machines" in operation. They are right, but the knack is almost purely a process of reason, and most of the troubles are caused by what old time radio men called a "short between the earphones," failures to use the head properly. Science functions entirely in accordance with the laws of reason, and a study of the art of science communication is really a miniature study of the art of rationality itself.”*




**Robert Pirsig, 1974**

# Conceptionary

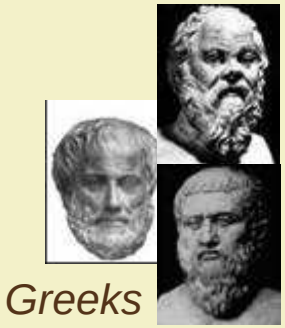
| | |
|---|---|
| ***Concept:*** | **Acid rain kills forests** |
| ***Definition:*** | **Acidification of rainfall by emissions kills trees** |
| ***Keywords:*** | **Atmospheric pollution ($NO_x$)**<br>**Acid rain**<br>**Tree death** |

Each person is timed and has to draw the concept for others to guess – all keywords must be written down to finish

# Slide title

- **Bullet points**

# Paradigm shifts occur when scientific discovery is effectively communicated to society

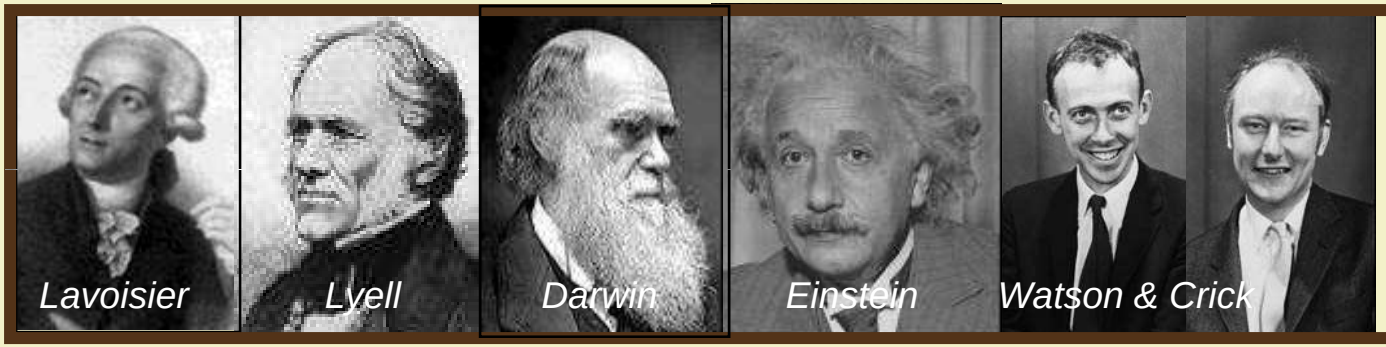


Greeks

1500-1550 | 1550-1600 | 1600-1650 | 1650-1700 | 1700-1750

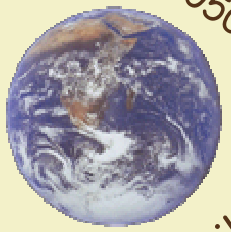

Astronomy | Physics | Astronomy | Physics | Biology

1750-1800 | 1800-1850 | 1850-1900 | 1900-1950 | 1950-2000



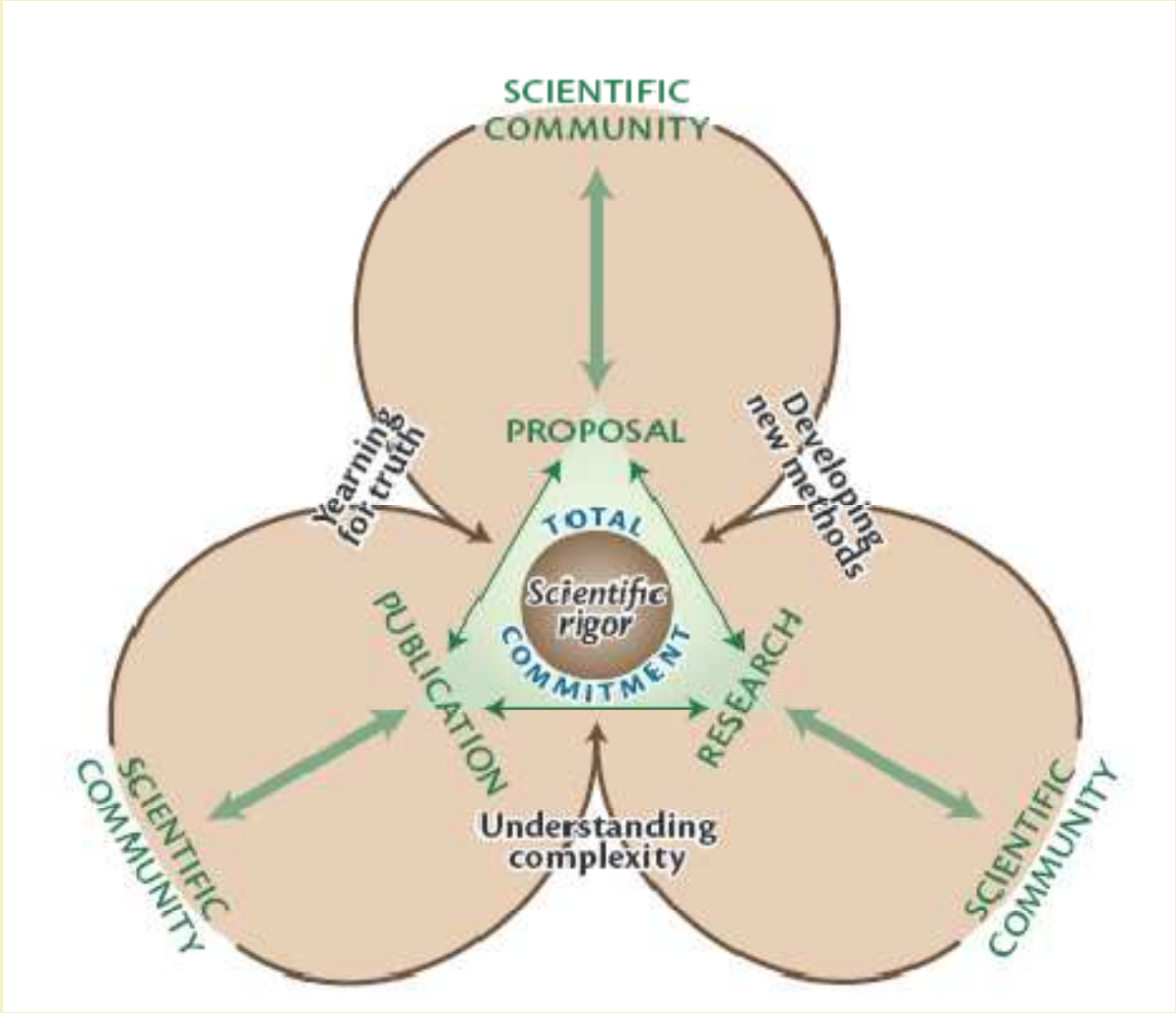

Chemistry | Geology | Evolution | Physics | Biology

2000-2050



Sustainability

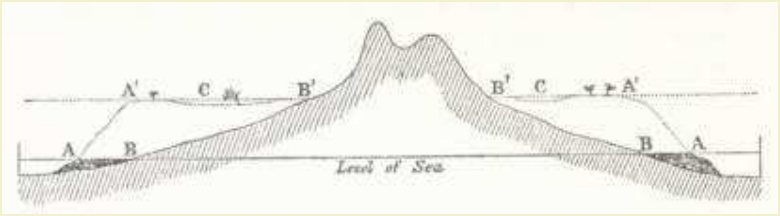
INTEGRATION & APPLICATION NETWORK


SCIENTIFIC COMMUNITY
PROPOSAL
Yearning for truth
Developing new methods
TOTAL
Scientific rigor
COMMITMENT
PUBLICATION
RESEARCH
SCIENTIFIC COMMUNITY
Understanding complexity
SCIENTIFIC COMMUNITY

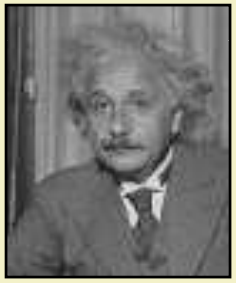
# The great scientists are/were also great communicators

*Charles Darwin:*
*119 published books & papers*

"Finally when …barrier-reefs … atolls… and fringing-reefs…are laid down on map, they offer a grand and harmonious picture of the movements which the crust of the earth has undergone within a late period. We there see vast areas rising, with volcanic outbursts; and we may feel sure that the movement has been so slow as to have allowed the corals to grow up to the surface, and so widely extended as to have buried over the broad face of the ocean every one of these mountains, above which the atolls now stand like monuments, marking the place of their burial."




The Structure and Distribution of Coral Reefs
*Charles Darwin, 1874 2nd Edition,*
*revised 1842 1st Edition*

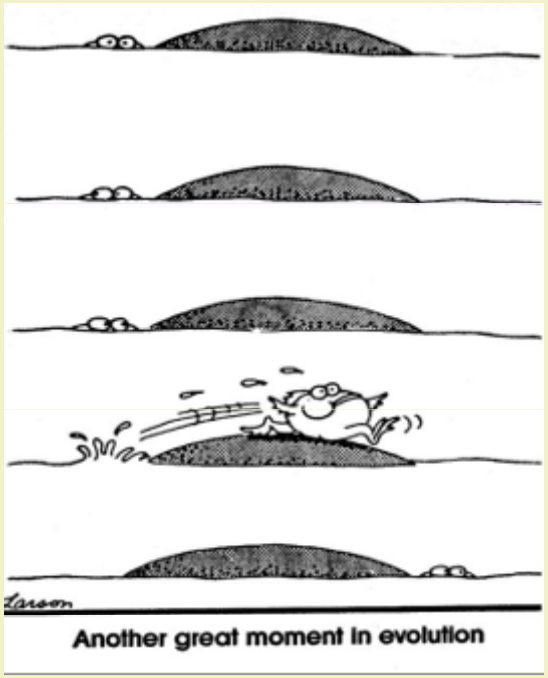


*Albert Einstein:*
*248 published books & papers*

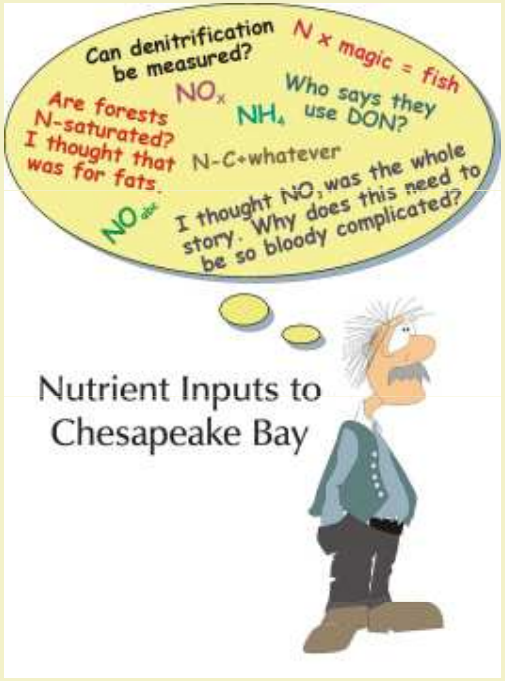
*"Make everything as simple as possible, but not simpler."* A. Einstein

# Topical humor can be effective

Seagrasses ‘reinvaded’ the sea from terrestrial ancestors




Walt Boynton's caricature




‘Cultivation grazing’ by dugongs structures seagrass communities